

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
14 August 2003 (14.08.2003)

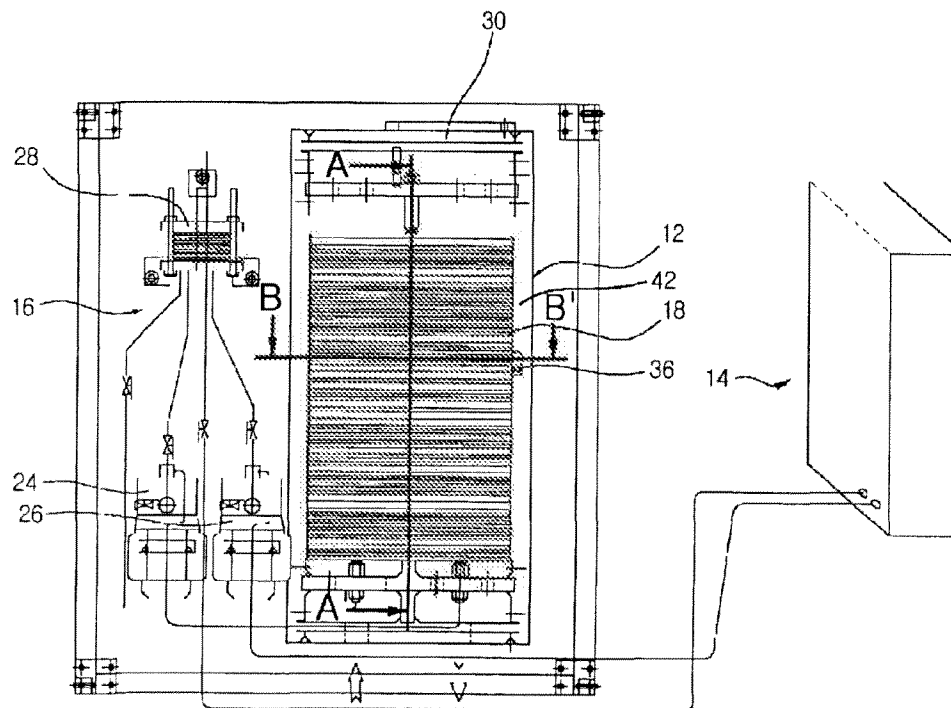
PCT

(10) International Publication Number
WO 03/066935 A1

- (51) International Patent Classification⁷: **C25B 1/02** (74) Agent: HAW, Yong-Noke; 8th Fl. Songchon Bldg., 642-15 Yoksam-dong, Kangnam-ku, 135-080 Seoul (KR).
- (21) International Application Number: PCT/KR02/01794
- (22) International Filing Date:
23 September 2002 (23.09.2002)
- (25) Filing Language: Korean
- (26) Publication Language: English
- (30) Priority Data:
2002/6146 4 February 2002 (04.02.2002) KR
- (71) Applicant (for all designated States except US): **E & E CORPORATION** [KR/KR]; Banwun-ri 488-4, Dae-an-eup, 445-973 Hwasung-goon, Gyunggi-do (KR).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **HYUN, Jang-Soo** [KR/KR]; 59-35, Yeokchon 2-dong, Eunpyeong-gu, 122-900 Seoul (KR).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: BROWN GAS GENERATOR



(57) Abstract: Disclosed herein is a Brown gas generator having a structure in which Brown gas is independently generated in different portions within an electrolytic cell in which electrolysis of electrolyte is performed, and water supply and water cooling are individually accomplished for the different portions, so that the temperature in the electrolytic cell is maintained in an optimal condition and an generation efficiency of Brown gas is maximized.

WO 03/066935 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

BROWN GAS GENERATOR

TECHNICAL FIELD

The present invention relates to a Brown gas generator,
5 and more particularly, to a Brown gas generator with a
structure in which Brown gas is independently generated
therewithin, thereby improving generation efficiency of
Brown gas.

10 BACKGROUND ART

Brown gas is a gas obtained by electrolysis of water
and a mixed gas of hydrogen and oxygen in the ratio of 2:1.
Generally, if water is electrolyzed, hydrogen and oxygen are
generated in a negative pole and a positive pole,
15 respectively. At this time, Brown gas can be obtained by
simultaneously collecting the two gases, not by separately
collecting them.

Unlike general gases, Brown gas has a peculiar property
that causes an implosion phenomenon during the combustion
20 thereof. In other words, an explosion phenomenon does not
occur during the combustion of Brown gas. Instead, flames
are inwardly gathered to thereby form a focus and make
surroundings vacuous.

As a result, if Brown gas is burnt, it is possible to

obtain an ultrahigh temperature at which even tungsten having the highest melting point can be sublimated.

Additionally, since thermic rays are not radiated outwardly, there is no loss of energy, which is caused by a
5 radiant heat, thus obtaining excellent energy efficiency.

An additional oxygen supply is unnecessary during the combustion of Brown gas since Brown gas itself contains oxygen. Further, there is no pollution problem since only water is generated as combustion products.

10 Because of the above-described merits, a Brown gas generator has been incessantly improved in its performance and safety and is widely used.

FIG. 1 is a view schematically showing an electrolytic cell of a conventional Brown gas generator.

15 Hereinafter, the electrolytic cell of the conventional Brown generator will be described with reference to FIG. 1.

Korean Utility Registration No. 20-203926, issued on Sept. 8, 2000, discloses the electrolytic cell of the Brown gas generator, in which a plurality of inner tubs 330a are
20 fixed within an outer tub 320 by upper and lower fixing plates 310a and 310b formed of an insulator.

Here, the inner tubs 330a function as electrodes and are preferably manufactured by plating a surface of mild steel with nickel in an electroless method. Also, the inner

tubs 330 can be variously formed in a cylinder shape, a rectangular shape or a polygonal cylinder shape.

The electrolytic cell is filled with an electrolyte in which water and electrolyte (KOH) are mixed with each other.

5 A central rod 330, the inner tubs 330a standing upright, and the outer tub 320 disposed at the outermost position are coupled to the upper and lower fixing plates 310a and 310b formed of insulating materials, thus maintaining an insulated state each other. However, since the electrolyte
10 is filled between the respective members, the inner tubs 330a are alternately set to a positive pole (+) and a negative pole (-) if a current is applied to both the central rod 330 and the outer tub 320.

As described above, due to a current alternately
15 induced at the respective inner tubs 330a as the positive pole (+) and the negative pole (-), oxygen and hydrogen are generated and mixed with each other to thereby generate Brown gas.

In such an electrolytic cell, heat caused by the
20 current is inevitably generated when Brown gas is generated using the electrolysis. When a temperature within the electrolytic cell is in the range of 50° to 60°, Brown gas can be generated maximally. Meanwhile, if a temperature within the electrolytic cell is higher than 60°, the

generation amount of Brown gas is rapidly reduced.

Therefore, if the temperature within the electrolytic cell is increased beyond a predetermined temperature when generating Brown gas, a temperature of the electrolyte must
5 be lowered.

According to the related art, in order to lower the temperature of the electrolyte contained in the electrolytic cell, there is provided fins which are in contact with an outer periphery of the outer tub and has a wide heat
10 radiation area, as shown in FIG. 1. By contacting the fins with a cool air using a fan, the outer tub is refrigerated and thus the electrolyte contacted with the refrigerated outer tub is also cooled.

However, in case that the electrolytic cell is
15 refrigerated using the air-cooled method as described above, the outer tub contacted with the fin is primarily refrigerated due to the cool air, and the electrolyte is cooled by its interfacial contact with an inner periphery of the refrigerated outer tub. Consequently, the cooling
20 performance is degraded due to the delay of the cooling time. Therefore, the productivity of Brown gas is degraded because it is difficult to maintain the electrolytic cell at the optimal temperature (50° to 60°) when generating Brown gas.

Additionally, although the electrolytic cell (an

electrolytic plate) has been formed in a cylinder shape, a flat-panel shape or a polygonal shape so as to widen the electrolytic area, there is still a limitation on the widening of the electrolytic area.

5 Further, the electrolyte is electrolyzed only between the respective inner tubs 330a facing each other, thus generating Brown gas. At this time, the electrolyte exists independently between the respective inner tubs 330a and it is also replete enough to make all the inner tubs 330a
10 electrified. Therefore, a voltage is also applied between the inner tubs 330a having no relation to the generation of Brown gas so that a current flows through them. As a result, an electric loss is incurred. Accordingly, the conventional Brown gas generator has a disadvantage that degrades the
15 efficiency of gas generation considering the voltage applied from an exterior.

DISCLOSURE OF THE INVENTION

Accordingly, the present invention is directed to a
20 Brown gas generator that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a Brown gas generator, in which predetermined portions where

an electrolysis of an electrolyte is performed are independently provided within an electrolytic cell and water supply and water cooling are individually carried out to the independent portions, thereby maintaining the temperature in the electrolytic cell at an optimal condition and maximizing an generation efficiency of Brown gas.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims thereof as well as the appended drawings.

To achieve the object, there is provided a Brown gas generator, which comprises: an electrolytic cell having a structure in which flat-type pole plates/insulating plates are coupled in pair with another flat-type pole plates/insulating plates, which are in interfacial contact with the flat-type pole plates/insulating plates, to thereby independently generate Brown gas, the flat-type pole plates and the insulating plates being fixed at the same positions upward and downward around a middle fixing plate, the flat-type pole plates and the insulating plates being coupled at

a regular interval by the middle fixing plate; an electrolyte adjustment means for circulating an electrolyte contained in the electrolytic cell to exchange heat of the electrolyte, and for replenishing a lack of the electrolyte;
5 a refrigerating means for adjusting a temperature of the electrolyte by refrigerating a heat exchanger of the electrolyte adjustment means to a predetermined temperature when the heat of the electrolyte is exchanged; and a multi-stage demister installed in an upper portion of the
10 electrolytic cell, for collecting Brown gas in one place.

The Brown gas generator of the present invention has a structure in which the flat-type pole plate/insulating plate is coupled in pair with another flat-type pole plate/insulating plate, which is in interfacial contact with
15 the flat-type pole plate/insulating plate, to thereby independently generate Brown gas. In other words, since flat-type pole plate and corresponding insulating plate forms one unit to independently generate Brown gas without being influenced by other units, Brown gas can be
20 efficiently generated without any electric loss. Additionally, because the electrolyte is independently supplied and circulated to the respective units, it is possible to maintain the optimal temperature for the generation of Brown gas.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

5

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

FIG. 1 is a view schematically showing an electrolytic cell of a conventional Brown gas generator;

FIG. 2 is a view showing a construction of a Brown gas generator in accordance with the present invention;

FIG. 3 is a side sectional view of the electrolytic cell installed within the Brown gas generator in accordance with the present invention, taken along the line A-A';

FIG. 4 is a view of a demister installed in an upper portion of the electrolytic cell of the Brown gas generator in accordance with the present invention; and

FIG. 5 is a sectional view of an inside of the

electrolytic cell including the water level sensor installed in the Brown gas generator of FIG.2, taken along the line B-B'.

5 BEST MODE FOR CARRYING OUT THE INVENTION

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. 2 is a view showing a construction of a Brown gas
10 generator in accordance with the present invention, and FIG. 3 is a side sectional view of the electrolytic cell installed within the Brown gas generator of the present invention, taken along the line A-A'.

Here, FIG. 2 is a top view of the Brown gas generator,
15 in which a demister is not shown in FIG. 2 so as to explain an inner structure of the electrolytic cell.

Additionally, although FIG. 3 is a side sectional view illustrating a predetermined portion of the electrolytic cell of FIG. 2, the demister that is not shown in FIG. 2 is
20 illustrated in FIG. 3.

A construction of the Brown gas generator in accordance with the present invention will be described below with reference to FIGs. 2 and 3.

The Brown gas generator of the present invention

includes: an electrolytic cell 12 having flat-type pole plates 20 and insulating plates 18 coupled to a middle fixing plate 32, in which an electrolyte consisting of water and electrolyte (KOH) is filled therein and the Brown gas is
5 generated by electrolyzing the electrolyte using an induced current generated alternately between the flat-type pole plates 20; an electrolyte adjustment unit 16 for exchanging a heat of the electrolyte and replenishing a lack of the electrolyte, in which the electrolyte adjustment unit 16
10 includes a circulation pump 24 for circulating the electrolyte contained in the electrolytic cell 12, a quantitative pump 26 for supplying water, and a heat exchanger 28 for performing a heat exchange after the electrolyte introduced into a refrigerating unit 14 is
15 cooled and circulating the electrolyte to the electrolytic cell 12; and the refrigerating unit 14 for automatically lowering a temperature of the electrolyte by refrigerating the heat exchanger 28 to a predetermined temperature when the heat of the electrolyte contained in the electrolytic cell
20 is exchanged through the heat exchanger 28.

A construction of the electrolytic cell 12 will be described below in detail.

Referring to FIG. 3, the electrolytic cell 12 includes: a lower fixing plate 34; a plurality of flat-type pole

plates 20 coupled to a middle fixing plate 32, an upper portion of the lower fixing plate 34 and a lower portion of the middle fixing plate 32 at regular intervals; and a plurality of insulating plates 18 coupled to an upper
5 portion of the middle fixing plate 32 at the same intervals as the flat-type pole plates 20.

Additionally, multi-stage demister 30 for collecting the generated gas is installed in an upper portion of the electrolytic cell 12. A water prevention screen 44 is
10 formed between the upper portion of the electrolytic cell 12 and the demister 30. A gas exhaust hole 46 is installed in the uppermost portion of the demister 30.

Further, a pressure sensor 38 is attached to a lateral outside of the electrolytic cell 12. A water level sensor
15 (not shown) is internally installed in a predetermined space inside an electrolytic cell case 42 adjacent to a lateral side of the electrolytic cell 12. An electricity lead-in unit 40 passing through the electrolytic cell case 42 is installed in a lateral side of the electrolytic cell 12 and
20 a lateral outside facing the electrolytic cell 12.

An operation of the Brown gas generator in accordance with the present invention will be described below in detail.

The middle fixing plate 32 and the lower fixing plate 34 are formed of an insulator. Preferably, the flat-type

pole plate 20 functioning as an electrode is manufactured by plating a surface of mild steel with nickel in an electroless method. The insulating plate 18 is formed of an insulator.

5 Additionally, the flat-type pole plates 20 and the insulating plates 18 are coupled to the lower and upper portions of the middle fixing plate 32 at the same intervals. The flat-type pole plates 20 and the insulating plates 18, which are in interfacial contact with each other, are
10 coupled in pair and each pair form one unit as an independent structure that generates Brown gas.

 In other words, one flat-type pole plate/insulating plate is coupled in pair with corresponding flat-type pole plate/insulating plate, which is in contact with the flat-
15 type pole plate/insulating plate, and the respective pairs independently generate Brown gas.

 Describing the structure in detail, the flat-type pole plates 20 facing each other are alternately set to a positive pole (+) and a negative pole (-) due to a voltage
20 applied to the electricity lead-in unit 40 passing through the lateral side of the electrolytic cell 12, and the electrolyte filled between them is electrolyzed to thereby generate Brown gas.

 At this time, the electrolyte filled within the

electrolytic cell must maintain a water level higher than the uppermost portion of the flat-type pole plate, i.e., the lower portion of the middle fixing plate 32.

According to the related art, in that case, a voltage
5 is applied due to the conductive electrolyte between the flat-type pole plates having no relation to the generation of Brown gas so that a current flows through them. As a result, an electric loss is incurred. Accordingly, the conventional Brown gas generator has a disadvantage that
10 degrades the efficiency of gas generation considering the voltage applied from an exterior.

In order to overcome the disadvantage of the related art, the electrolytic cell 12 of the present invention makes the electrolyte not flow to the flat-type pole plates 20,
15 which do not correspond to the insulating plates coupled to the middle fixing plate 32 at the same intervals as the flat-type pole plates 20, even when the electrolyte maintains the water level higher than the uppermost portion of the flat-type pole plate 20.

20 Here, the middle fixing plate 32 has holes between the flat-type pole plates 20 and the insulating plates 18, which are coupled at regular intervals, so that the electrolyte flows up and down the middle fixing plate 32 between the flat-type pole plates 20 and the insulating plates 18, which

are coupled in pair.

In other words, the electrolyte flows only in the independent structure in which the flat-type pole plate/insulating plate is coupled in pair with another flat-type pole plate/insulating plate, which is in interfacial contact with the flat-type pole/insulating plate, and the electrolyte does not flow in the flat-type pole plates that do not correspond to the insulating plates.

Accordingly, due to the applied voltage, the corresponding flat-type pole plates electrolyze the electrolyte existing between them without any electric loss, thereby efficiently generating Brown gas.

Additionally, considering that the water level of the electrolyte rises due to increases in volume and pressure of the electrolyte heated by the electrolysis, the insulating plate is manufactured high enough.

As is well known, when generating Brown gas, the optimal temperature of the electrolyte contained in the electrolytic cell 12 is about 50° to 60°. However, since the electrolytic cell 12 generates a high-temperature heat during the electrolysis, if the electrolytic cell 12 is not refrigerated, the generation amount of Brown gas is rapidly reduced due to the rising temperature.

Accordingly, in the Brown gas generator of the present

invention, the refrigerating unit 14 is installed in an outside of the electrolytic cell 12. Also, the electrolyte contained in the electrolytic cell 12 is circulated through the heat exchanger 28 so that the heat exchanger 28 is
5 refrigerated. As a result, since the temperature of the electrolyte is lowered, the temperature of the electrolytic cell 12 can be always maintained to a constant state.

The electrolyte adjustment unit 16 performing the above function includes the circulation pump 24 for circulating
10 the electrolyte contained in the electrolytic cell 12, the quantitative pump 26 for supplying water, and the heat exchanger 28 for performing a heat exchange after the electrolyte introduced into the refrigerating unit 14 is cooled and circulating the electrolyte to the electrolytic
15 cell 12.

Additionally, the supply and circulation of the electrolyte contained in the electrolytic cell 12 is independently performed between the flat-type pole plates 20 and the insulating plates 18, which form the respective
20 units. The electrolyte can be introduced into the insulating plates 18 forming the units or discharged to the flat-panel plates 20. Alternatively, the electrolyte can be introduced into the flat-panel pole plates 20 or discharged to the insulating plates 18.

FIG. 4 is a view of the demister installed in an upper portion of the electrolytic cell of the Brown gas generator in accordance with the present invention.

Hereinafter, the demister installed in the upper
5 portion of the electrolytic cell will be described with reference to FIG. 4. In the related art, the demisters 30 are installed in the respective electrolytic cells 12. As shown in FIG. 4, however, according to the present invention, the demister 30 that can collect all Brown gases generated
10 in the electrolytic cell 12 in one place is installed in an upper portion of the electrolytic cell 12.

If Brown gas collected by the demister 30 contains water, a property of Brown gas is badly influenced. Therefore, as shown in FIG. 3, the multi-layered water
15 prevention screen 14 for preventing a splash of water is formed between the demister 30 and the upper portion of the electrolytic cell 12.

A plurality of holes are formed in the water prevention screen 14, and Brown gas is discharged to the demister
20 through the holes. Positions of the holes formed in the respective water prevention screen 44 are not overlapped with those formed in the water prevention screen 44 facing each other upward and downward. Therefore, water is not splashed at any place. If the water prevention screen 44 is

formed in more layers, the splash of water can be minimized. However, if the water prevention screen 44 is formed in too much layers, the passage of Brown gas is obstructed so that it is difficult to collect Brown gas. Therefore, the water
5 prevention screen 44 should be manufactured in consideration for that.

Further, since the demister 30 has a multi-stage structure and also has a structure for refrigerating Brown gas therewithin, moisture contained in Brown gas is removed
10 so that pure Brown gas is collected. Since Brown gas exhausted from the gas exhaust hole 46 finally passes through the refrigerating unit, pure Brown gas can be obtained.

Furthermore, an evaporation steam cooled at the
15 demister 30 flows backward to the electrolytic cell 12, thereby preventing an increase in the temperature of the electrolyte contained in the electrolytic cell 12.

FIG. 5 is a sectional view of the inside of the electrolytic cell including the water level sensor installed
20 in the Brown gas generator of FIG.2, taken along the line B-B'.

Here, although FIG. 5 is a sectional view of a predetermined portion of the electrolytic cell shown in FIG. 2, taken along the line A-A', the demister that is not shown

in FIG. 2 is illustrated in FIG. 5

The inner structure of the electrolytic cell having the water level sensor will be described with reference to FIG. 5.

5 In the conventional Brown gas generator, a water gauge passing through a portion of the electrolytic cell case to maintain the same water level as the inside of the electrolytic cell is installed in an outside of the electrolytic cell case, and the water level sensor is
10 attached to the inside of the water gauge.

However, due to a temporary pressure variation in the inside of the electrolytic cell, there occurs the case that the pressure in the inside of the electrolytic cell may not accord with that of the externally installed water gauge for
15 a short time. As a result, the water level sensor installed so as to maintain the water level of the electrolyte beyond the uppermost portion of the flat-type pole plate does not sufficiently perform its own function.

On the contrary, in the Brown gas generator of the
20 present invention, the same space as the inside of the electrolytic cell 12 is maintained by providing a predetermined space inside the electrolytic cell case 42, and the water level sensor 36 is attached to the predetermined space.

The predetermined space is a space provided inside the electrolytic cell case 42, where the uppermost portion of the flat-type pole plate 20 is the lowest point and a predetermined height of the insulating plate 18 is the
5 highest point.

Because the space where the water level sensor 36 is attached and the inside of the electrolytic cell 12 shares the same space and the pressures of them are equal to each other, the water level sensor 36 can always correctly
10 determine the water level of the inside of the electrolytic cell 12.

Further, since the electrolytic cell case 42 is formed of an insulator, the voltage or current of the inside of the electrolytic cell 12 does not influence the outside of the
15 electrolytic cell 12.

The pressure sensor 38 determines the internal pressure of the electrolytic cell 12. If the internal pressure of the electrolytic cell 12 is larger than a predetermined pressure, the electricity supplied to the electrolytic cell
20 12 is cut off by applying a signal to a gas control unit 50. Meanwhile, if the internal pressure of the electrolytic cell 12 is smaller than the predetermined pressure, the electricity is again supplied to the electrolytic cell 12 to thereby generate Brown gas.

INDUSTRIAL APPLICATION

As described above, the Brown gas generator of the present invention has a structure in which the flat-type pole plate/insulating plate is coupled in pair with another flat-type pole plate/insulating plate, which is in interfacial contact with the flat-type pole plate/insulating plate, to thereby independently generate Brown gas. In other words, since flat-type pole plates and corresponding insulating plates form one unit to independently generate Brown gas without being influenced by other units, Brown gas can be efficiently generated without any electric loss.

Additionally, since the electrolyte is independently supplied and circulated to the respective units, it is possible to maintain the optimal temperature for the generation of Brown gas.

Further, since moisture contained in Brown gas is removed by cooling Brown gas collected by the water prevention screen and the multi-stage demister, it is possible to obtain pure Brown gas.

Furthermore, since the water level sensor is provided in the same space as the inside of the electrolytic cell, it is possible to correctly determine the variation of the water level according to the temporary pressure change in

the inside of the electrolytic cell.

While the present invention has been described and illustrated herein with reference to the preferred embodiments thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention that come within the scope of the appended claims and there equivalents.

CLAIMS:

1. A Brown gas generator comprising:

an electrolytic cell having a structure in which flat-
5 type pole plates/insulating plates are coupled in pair with
another flat-type pole plates/insulating plates, which are
in interfacial contact with the flat-type pole
plates/insulating plates, to thereby independently generate
Brown gas, the flat-type pole plates and the insulating
10 plates being fixed at the same positions upward and downward
around a middle fixing plate, the flat-type pole plates and
the insulating plates being coupled at a regular interval by
the middle fixing plate;

an electrolyte adjustment means for circulating an
15 electrolyte contained in the electrolytic cell to exchange
heat of the electrolyte, and for replenishing a lack of the
electrolyte;

a refrigerating means for adjusting a temperature of
the electrolyte by refrigerating a heat exchanger of the
20 electrolyte adjustment means to a predetermined temperature
when the heat of the electrolyte is exchanged; and

a multi-stage demister installed in an upper portion of
the electrolytic cell, for collecting Brown gas in one place.

2. The Brown gas generator according to claim 1,
wherein the flat-type pole plates facing each other are
alternately set to a positive pole (+) and a negative pole
(-) due to a voltage applied to an electricity lead-in unit
5 passing through a lateral side of the electrolytic cell, and
the electrolyte filled between the flat-type pole plates is
electrolyzed to thereby generate the Brown gas.

3. The Brown gas generator according to claim 1,
10 further comprising a water level sensor disposed at a
predetermined space of an inside of an electrolytic cell
case.

4. The Brown gas generator according to claim 1 or
15 claim 3, wherein the electrolytic cell case is formed of an
insulator and the predetermine space has an area where the
uppermost portion of the flat-type pole plate is the lowest
point and a predetermined height of the insulating plate is
the highest point.

20

5. The Brown gas generator according to claim 1,
further comprising a water prevention screen installed
between an upper portion of the electrolytic cell and the
demister, the water prevention screen including a plurality

of holes for preventing the electrolyte filled up to a lower portion of the electrolytic cell from being splashed to the demister while collecting the Brown gas.

5 6. The Brown gas generator according to claim 1, wherein the electrolyte adjustment means supplies the electrolyte independently to the structure in which the flat-type pole plates/insulating plates are coupled in pair with another flat-type pole plates/insulating plates, which
10 are in interfacial contact with the flat-type pole plates/insulating plates to thereby generate the Brown gas independently.

 7. The Brown gas generator according to claim 1,
15 wherein the multi-stage demister includes a structure for cooling the Brown gas.

 8. The Brown gas generator according to claim 5, wherein the water prevention screen is formed with multi-
20 layers, and holes formed in the water prevention screen are arranged alternately with respect to positions of holes formed in upper or lower layers to thereby minimize a splash of the electrolyte.

9. A Brown gas generator, the Brown gas generator including an electrolytic cell, an electrolyte adjustment means for adjusting a water level of the electrolytic cell, a refrigerating means for lowering a temperature of the electrolyte, and a demister, wherein the electrolytic cell includes:

flat-type pole plates and insulating plates being installed at regular intervals, each pair of interfacial-contacted flat-type pole plates and insulating plates generating Brown gas independently; and

a middle fixing plate for fixing the flat-type pole plates and the insulating plates at the same position upward and downward.

10. A Brown gas generator comprising:

an electrolytic cell having flat-type pole plates and insulating plates, one flat-type pole plate and one insulating plate forming one unit for generating Brown gas;

an electrolyte adjustment means for circulating the electrolyte contained in the electrolytic cell to exchange a heat of the electrolyte, and for replenishing a lack of the electrolyte; and

a refrigerating means for automatically lowering a temperature of the electrolyte contained in the electrolytic

cell.

11. The Brown gas generator according to claim 9,
wherein the flat-type pole plates and the insulating plates
5 are coupled at regular intervals by a middle fixing plate,
and one unit consisting of the flat-type pole plate and the
insulating plate generates Brown gas without being
influenced by another unit consisting of the flat-type pole
plate and the insulating plate.

10

12. The Brown gas generator according to claim 9,
wherein the electrolyte contained in the electrolytic cell
is independently supplied and circulated to the respective
units consisting of the flat-type pole plates and the
15 insulating plates.

Fig.1

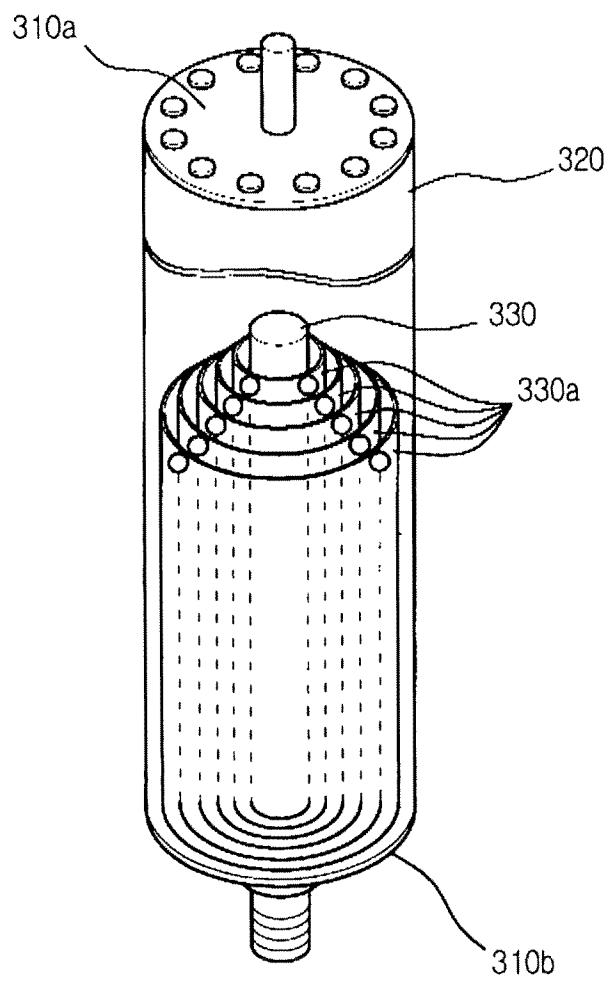


Fig.2

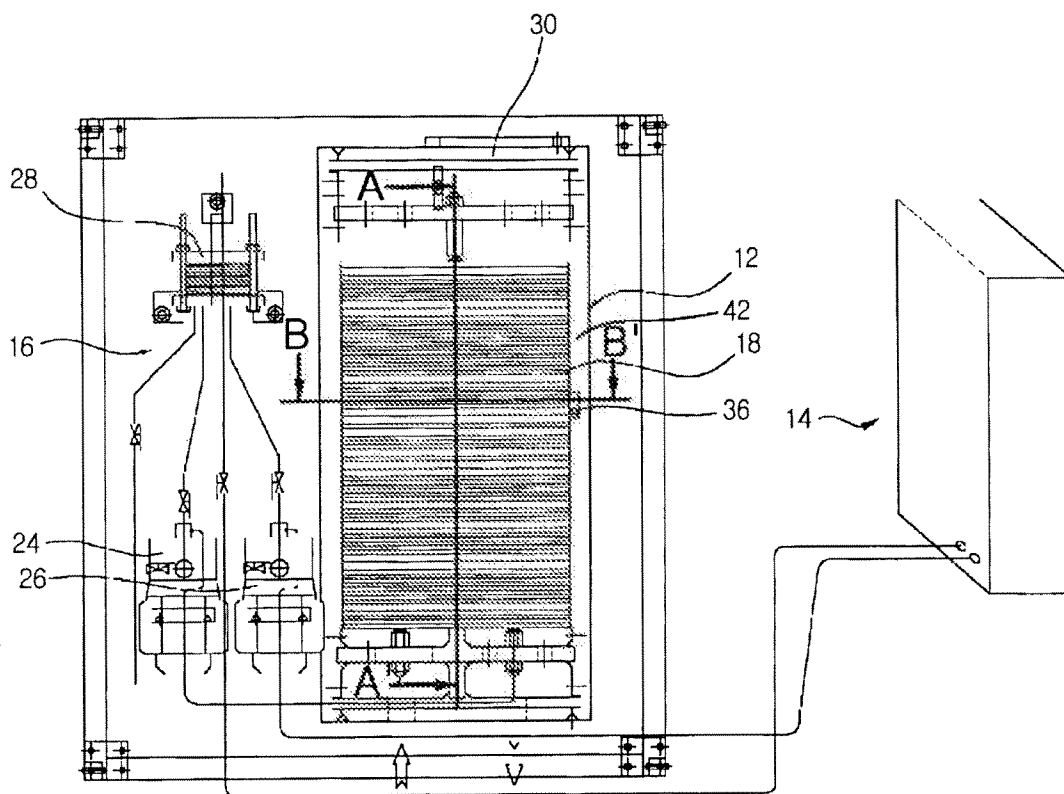


Fig.3

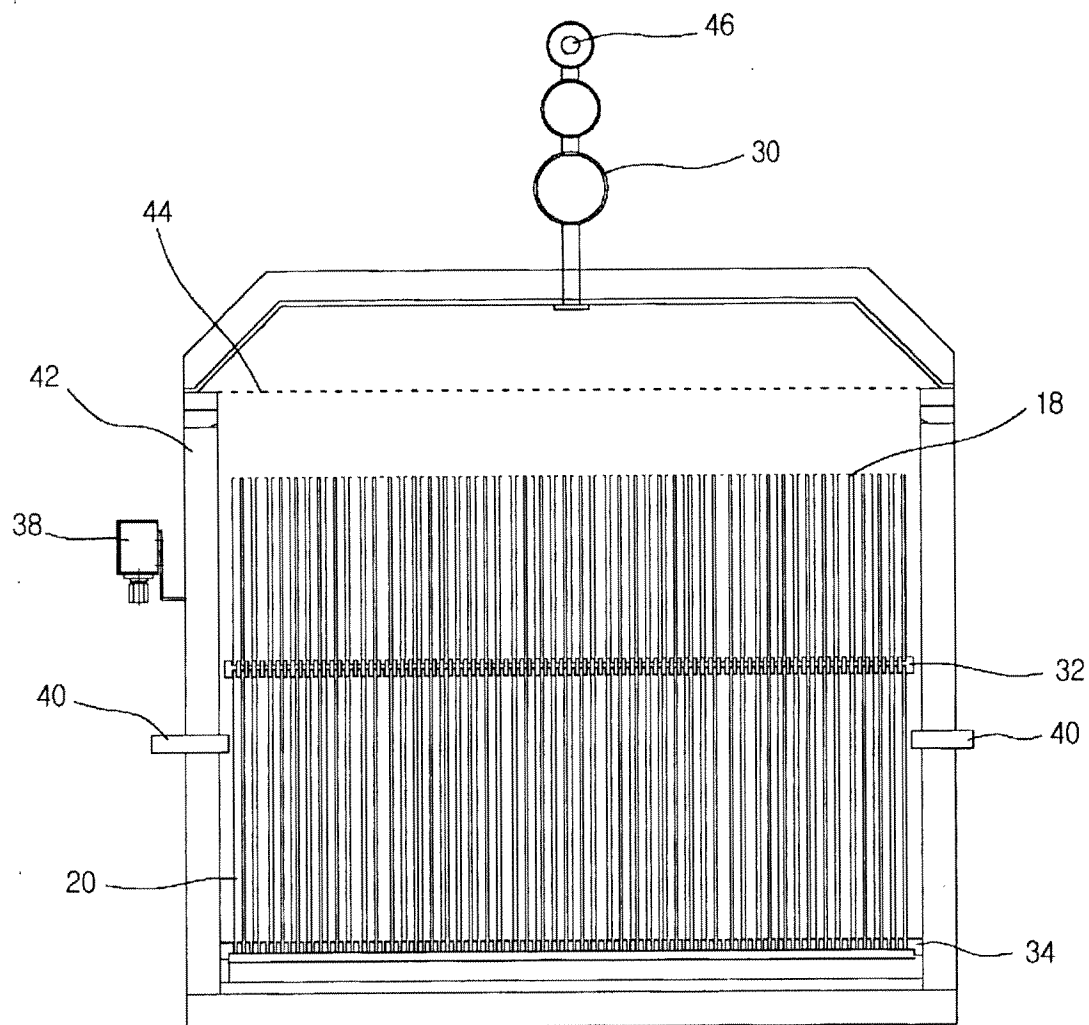


Fig.4

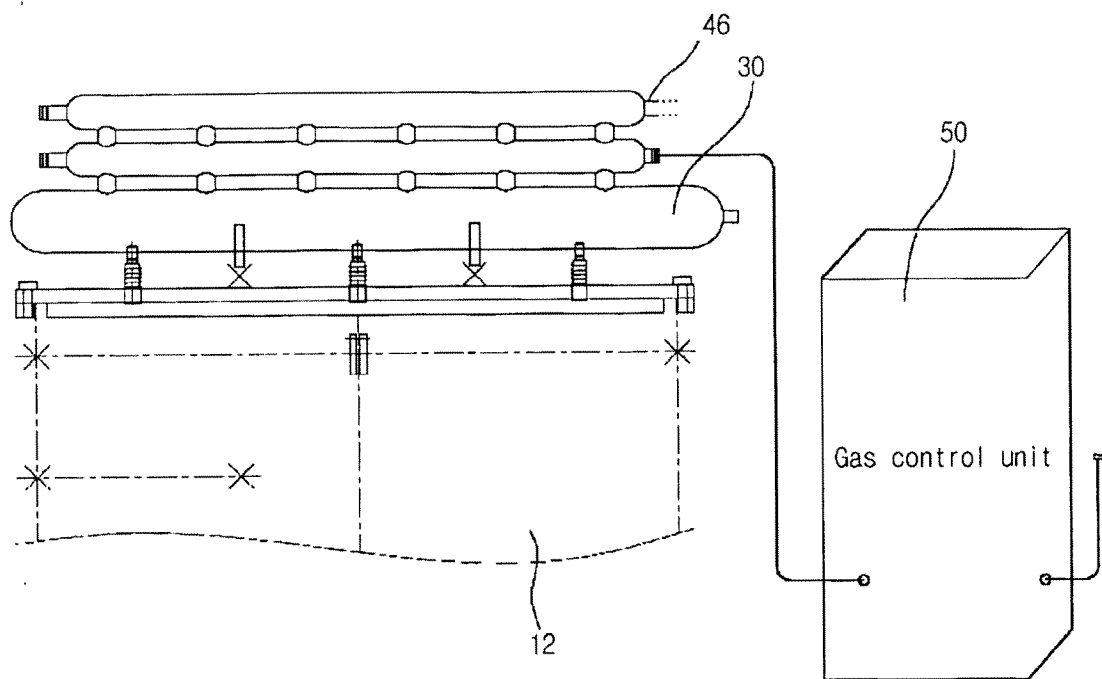
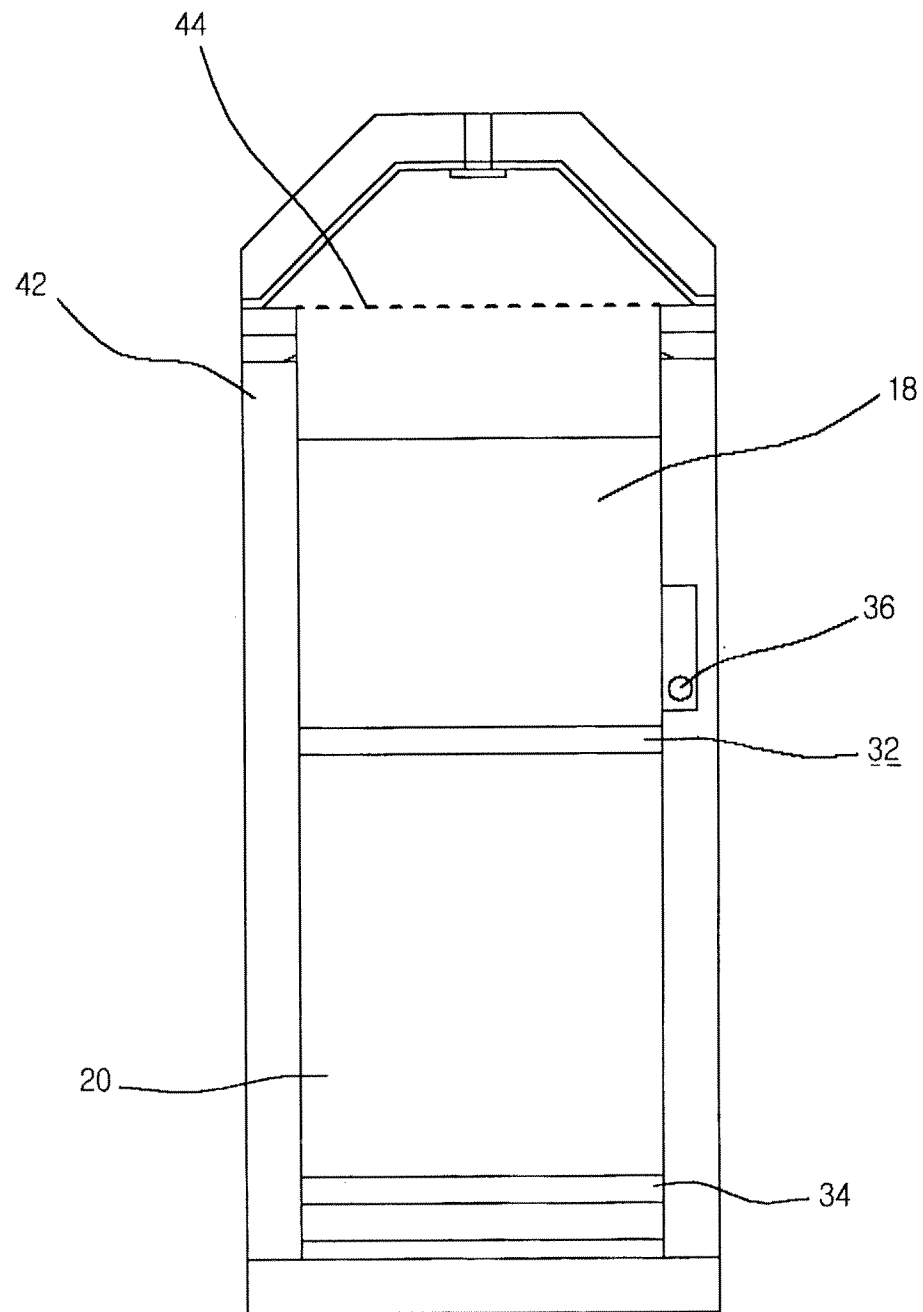


Fig.5



A. CLASSIFICATION OF SUBJECT MATTER**IPC7 C25B 1/02**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 C25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and applications for inventions since 1975, Korean Utility models and applications for Utility models since 1975,
Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NPS, PAJ "hydrogen, oxygen, electrolysis"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6068741 A (WEN CHANG LIN) 30 MAY 2000 See claims and figure 1	1
A	KR 2000-26861 A (KIM SANG NAM) 12 MAY 2000 See claims and figure 5	1
A	JP 11-302885 A (OTAKAISUO) 2 NOVEMBER 1999 See claims and figure 1,2,3	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

22 JANUARY 2003 (22.01.2003)

Date of mailing of the international search report

22 JANUARY 2003 (22.01.2003)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Yong Jung

Telephone No. 82-42-481-5557



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR02/01794

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6068741 A	30.05.2000.	GB2341615 A1	22.03.2000.
KR 2000-26861 A	12.05.2000.	NONE	
JP 11-302885 A	02.11.1999.	NONE	